Suggestions for Establishing Centers for Engineering Education

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Introduction

At the 2001 ASEE Annual Conference, a group of individuals gathered for a session entitled "A Roundtable Discussion of Best Practices for Developing Centers for Engineering Education, Teaching, and Learning". The event was part of the Breakfast of Champions session, regularly sponsored by the Educational Research Methods division of ASEE. Eleven people directly involved in existing centers for engineering education were invited to serve as *experts* for the discussion, and 32 people not officially involved in such a center joined in the discussion. The background of attendees varied from engineering educators and administrators to instructional and professional development practitioners. The participants represented 33 different institutions.

After brief introductions, participants were divided into small working groups of five to eight to discuss one issue relevant to emerging centers for engineering education. These issues included:

1. *Developing support for a teaching and learning center*
2. *Engaging faculty in programs developed by teaching and learning centers*
3. *Sustaining changes implemented by teaching and learning centers*
4. *Relating teaching and learning center innovations to assessment efforts*
5. *Providing opportunities for other institutions to benefit from existing teaching and learning centers*
6. *Maintaining useful contacts among current and future centers for teaching and learning*

This paper examines the current state of centers for engineering education within the United States and provides some information regarding their structure and mission. Results from the roundtable discussions described above are also provided. Finally, the authors share their insights on developing the Center for Excellence in Teaching and Learning (CETL) at Kettering University over the past year, and they relate these to the best practices developed at the session described above. The authors' experiences in establishing CETL, as well as their reflections on the roundtable discussion, may prove valuable to others wishing to propose their own center. For further information on developing teaching and learning centers, the reader is encouraged to review material by Wadsworth [1] and Sorcinelli [2].

Current Centers

Centers for teaching and learning are widespread at colleges and universities nationwide. The website of the Center for Teaching Excellence at the University of Kansas (www.ku.edu/~cte/resources/websites.html) lists more than 125 universities and community

colleges in the United States whose centers have web sites. However, few centers exist which focus specifically on *engineering* education. In a report for the National Academy of Engineering [3], nine universities with centers for engineering education are listed, as are three proposed engineering education centers. The nine established centers and their associated websites are listed here.

- Arizona State University: Center for Research on Education in Science, Mathematics, Engineering, and Technology (www.eas.asu.edu/~cresmet/)
- Colorado School of Mines: Center for Engineering Education (www.mines.edu/research/cee/)
- Georgia Institute of Technology: Center for the Enhancement of Teaching and Learning (www.cetl.gatech.edu/)
- Purdue School of Engineering and Technology, IUPUI: Education Development Center (www.engr.iupui.edu/edc/index.html)
- Kettering University: Center for Excellence in Teaching and Learning (www.kettering.edu/cetl/)
- Pennsylvania State University: Leonhard Center for the Enhancement of Engineering Education (www.engr.psu.edu/www2/centers/leonhardcenter/lc/index.htm)
- University of Illinois at Urbana-Champaign: Academy for Excellence in Engineering Education (ae3.cen.uiuc.edu/)
- University of Washington: Center for Engineering Learning and Teaching (www.engr.washington.edu/celt/)
- University of Wisconsin-Madison: Engineering Learning Center (www.engr.wisc.edu/services/elc/) and Wisconsin Engineering Education Laboratory (www.engr.wisc.edu/weel/)

The centers listed here have a variety of goals and missions, ranging from offering extensive opportunities for faculty development and TA training to serving as a focal point for assessment efforts. Some of the centers facilitate extensive research into learning and assist faculty in identifying funding opportunities. Generally the centers are supported by the institute's budget and have a half-time or full-time director to lead their activities. Based on the success of these centers, other schools have been considering establishing centers for engineering education. To assist in this effort, the roundtable discussion at the 2001 ASEE Annual Conference was organized.

Results of the Roundtable Discussion

As described earlier, six issues pertaining to establishing a center for teaching and learning were discussed by the groups. Responses of the participants are compiled here.

1. Developing support for a teaching and learning center

A variety of ideas regarding how to support such a center were discussed, and the group agreed that before establishing a teaching and learning center, a critical mass of support was required. Perhaps most important is finding an individual leader willing to forward the idea of creating a center, organize meetings, compile materials, and seek further support for the development of a center.

Furthermore, when putting together plans to develop a center, it is essential that a sponsor be identified who can help with funding. This may be a key administrator, local philanthropic organization, alumnus, or corporate sponsor. In this regard the invited experts stressed that

institutional funding to support infrastructure (particularly staff) is vitally important. Removing the reliance on soft-money allows the center staff to focus on more productive efforts.

Another key element is identifying a group of enthusiastic individuals who are proponents for a center. Getting faculty 'buy-in' is always a difficult task, but having a group of faculty who can spread the word about the value of a center can make the challenge less daunting. Additionally, once a center has been developed, new programs will almost certainly involve the participation of a core group of dedicated faculty (a.k.a. "The Choir"). Identifying these individuals early on, even before the center officially exists, allows for center personnel to involve these individuals in future programs, both as participants and organizers.

One suggestion that came from the workshop participants was to connect the development of the center to a particular institutional goal. This provides legitimacy and increases the likelihood of faculty buy-in. For example, if the institution is seeking to increase its research initiatives, it may be wise to emphasize educational research through the center. An institution undergoing ABET accreditation may wish to have the center focus on training faculty in assessment methodologies.

2. Engaging faculty in programs developed by teaching and learning centers

A common challenge faced by both new and established centers is getting faculty to participate in programs despite busy schedules, lack of information about what a center can offer, and a belief among some that teaching improvement is unimportant. Workshop attendees identified several ideas for overcoming these challenges.

One solution involves the center personnel. While having trained professional and instructional development staff available in a center is important, creating a center position – perhaps even the center director – occupied by a faculty member is likely to provide legitimacy for center activities and provide a critical communication link.

Other suggestions focused on allowing the center's direction to be guided by faculty input. The center personnel should continuously seek faculty feedback for programs they feel would be of benefit. In this way, the center can respond to faculty needs and further the impression that the center exists to support faculty development, rather than issuing decrees. It was also suggested that the center's goals should be kept realistic. Personnel should encourage faculty to consider small, self-directed changes that they are willing and able to make in a short period of time, thereby increasing the probability that these programs will be sustainable long-term. Attendees also identified solutions that focused on the nature of learning and are more practical for faculty in a particular area of study. The presence of research findings that support the types of initiatives the center is proposing may also increase faculty acceptance.

3. Sustaining changes implemented by teaching and learning centers

Participants discussing this topic concluded that only about 10% of faculty at any given institution will actively initiate changes in educational practice at their schools. Consequently, most efforts at teaching and learning improvement were directed from the top down causing tension between faculty and administration over what should be a mutual task. Given this

scenario, how can centers implement changes that will be well received by faculty and be sustainable?

The most common solutions seemed to focus around the idea of helping faculty more readily accept change. One such solution was to celebrate change and present changes in a way that will help faculty accept them. For example, providing leadership and motivation to faculty can be very beneficial. This can be accomplished by identifying groups interested in particular changes, creating links between various groups to create a critical mass for change, and publicly recognizing and rewarding these groups for their efforts.

Participants suggested that a successful approach might be to maintain a student-centered focus. The center could suggest changes that emphasize increases in retention, cognition, and development of professional skills. By focusing on better preparing students, resistance to change may be less significant.

Attendees also indicated that having sufficient funds available was important to sustaining changes. Having funds provided directly by the institution is the best option, but in many cases it is either unavailable or insufficient to meet the center's needs. Acquiring information about alternative funding sources and determining the best approach to successful proposal writing can be challenging. Suggestions included searching for information on the Internet, contacting funding agencies directly to discuss ideas for proposals, and forming an advisory board that can assist in searching for funds.

4. Relating teaching and learning center innovations to assessment efforts

With the introduction of ABET Criteria EC2000, assessment has become a topic of unending discussion on engineering campuses. In light of the importance of this topic, session participants were asked to consider how centers could assist faculty and departments in establishing and sustaining successful assessment efforts.

According to the discussion group, centers should encourage faculty to view the ABET process as an opportunity to explore teaching and learning and consider possible changes to their teaching. Via this process, center personnel could work with faculty to identify assessment tools that could drive this change (e.g., surveys, concept maps, portfolios, etc.). The center could also bring in educational/assessment experts who could work with interested faculty to develop new approaches of collecting assessment data and to change their teaching style based on this data.

Centers could become more directly involved in helping faculty become adept at dealing with the assessment process. For example, they could conduct workshops and short programs on assessment followed by training and materials for faculty responsible for the assessment efforts in their departments. A center may also consider forming a supportive community of these individuals in which they might work more closely together on assessment approaches.

5. *Providing opportunities for other institutions to benefit from existing teaching and learning centers*

The group discussing this issue identified two primary challenges: finding ways to support institutions without opportunities for funding and reducing the separation between community colleges and 4-year institutions.

Many smaller institutions simply do not have the resources to develop teaching and learning centers. In generating solutions to this problem, the group focused on the idea of regional coalitions between schools with and without centers. Coalition schools could partner to develop proposals that earmark money for non-center members. In turn, satellite institutions could provide valuable data for larger research studies that are then more likely to have a broad impact and be more attractive to funding agencies. Rotating workshops could also be instituted to involve faculty from all institutions. In the case of regional coalitions, it may even be possible to invite faculty to attend workshops held at other schools to increase cross-pollination of ideas.

The group also felt that it would be important to reduce the gap between 4-year institutions and community colleges, particularly by including them in any regional coalitions that might be developed. Additionally, teaching and learning centers could sponsor informal meetings between faculty at community colleges and 4-year schools to share teaching experiences or include a regular entry from community college faculty in a center newsletter. Many community colleges already have teaching and learning centers and could provide considerable insight to 4-year colleges.

6. *Maintaining useful contacts among current and future centers for teaching and learning*

Participants at the roundtable discussions provided several possible solutions to this issue. One suggestion was to organize a regular meeting of the directors of engineering education centers at the annual American Society for Engineering Education conference each summer. An informal dinner of this sort was held during the 2001 ASEE Annual Conference and Exposition, but it is likely that greater information sharing could take place if a more formal meeting were arranged.

Another suggestion identified by workshop participants was to develop a listserv or discussion-board open to center personnel and potentially interested novices. This is rather simple to develop and inexpensive. However, promoting useful information sharing can be difficult given the more 'voluntary' nature of the discussion. A slight twist on this idea is to have ASEE Headquarters develop a web-site containing links to each existing center and information relevant to those currently working in centers and those interested in potentially beginning a center.

Experiences in Starting a Center

The roundtable session described in this paper was organized by the authors who were interested in establishing a teaching and learning center at their own institution. Although the timing of the discussion was such that many plans for the center were already complete, the results of the roundtable discussion were used to assess and focus the efforts at Kettering University. This section describes the authors' experiences and relates those to ideas generated at that discussion.

Kettering University is a primarily undergraduate institution offering mostly engineering degrees. The school was founded as General Motors Institute in 1919, and since then it has not had a centralized office for faculty development. In 2001, the Center for Excellence in Teaching and Learning (CETL) was established to fill that void.

CETL is the brainchild of a faculty-initiated effort for teaching improvement, the Teaching Fellows. The authors formed this group in an effort to improve the climate for teaching at Kettering. The group gained membership and momentum and, with the support and assistance of several key administrators, proposed that an official center for teaching and learning be established at Kettering. In the proposal, the group included a mission statement ("...to support teaching excellence at Kettering University") and six supporting goals for the center:

a. To promote a learner-centered educational community
b. To encourage and support the teaching-related professional development of all educators
c. To archive and disseminate teaching and learning resources
d. To coordinate activities for improvement of teaching and learning
e. To support innovation and scholarship activities related to teaching and learning and promote educational research
f. To provide training for faculty in student outcomes assessment.

The group also proposed that the director for CETL be selected from the faculty and be given a half-time teaching load for the duration of his/her appointment.

The proposal was accepted, Cynthia Finelli was selected as the first director in 2001, and to prepare for the opening of CETL, the authors organized the roundtable session described in this paper. Also, Dr. Finelli attended *The National Teaching College*, a series of workshops offered by University of Illinois' Academy for Excellence in Engineering Education (ae3.cen.uiuc.edu/ntc/). The workshop validated many of the ideas generated at the roundtable discussion described above.

1. Developing support for a teaching and learning center

Kettering has been successful in developing support for CETL. This success is due primarily to the way in which the center was established – having a faculty-led initiative coupled with strong administrative support. Before the center was opened, a critical mass of faculty support was already established since the Teaching Fellows group was heavily involved in proposing the center. Additionally, both authors were faculty champions for CETL, and a multidisciplinary advisory board was created early on to support the center. Initial financial support was provided by a generous donation from Ford Motor Company, and the Provost has indicated that ongoing support for CETL will become a part of the operating budget of the university. Although CETL

was not directly connected to a Kettering University goal prior to its opening (a suggestion from the roundtable participants), the institute has recently undergone a strategic planning initiative and CETL is clearly linked to the goals developed there.

2. Engaging faculty in programs developed by teaching and learning centers

CETL has been successful at engaging faculty in programs, partly by providing a variety of carefully selected offerings. Before the center opened, the director conducted a survey to gauge faculty interest, and the programs offered by CETL reflect the results of the survey. For instance, CETL offered workshops on student learning styles at the grand opening activities and more than 100 people attended. CETL has also hosted a workshop on problem-based cooperative learning (19 people, or approximately 15% of the faculty, attended) and training sessions for Blackboard (35 faculty have participated). Fifteen faculty attended a training session for a voluntary peer observation program, and the group completed paired observations of seven classrooms.

CETL facilitates a bimonthly discussion series initiated by the Teaching Fellows. The series began as a forum for Outstanding Teachers of the Year to describe their success in the classroom, and it has evolved to include presentations by outside speakers and various open discussions. Two semester-long series, one focused on the evaluation of teaching and one on educational research and the scholarship of teaching, were also planned. Many faculty, staff, and administrators have attended the series (attendance averages over 20), and feedback has been good. A "mini-conference" on educational research, featuring a workshop facilitated by an outside speaker and a poster session for faculty to share their experiences, was also well attended.

Another factor in CETL's success in engaging faculty is its extensive communication efforts. Since its opening in October 2001, CETL has published a variety of brochures and informational handouts. The center created an extensive web site and distributes a bimonthly newsletter to share information with the Kettering community. The center has also accumulated a multimedia library with books, videos, and other materials related to teaching and learning. Although these resources have not been widely utilized by faculty, plans to include a list of available material on the CETL web site should improve their use.

Not all of the programs initiated by CETL, though, have been completely successful. A weekly coffee-hour style discussion focused on a particular topic has had low attendance (only two to six participants each week). Plans to improve this activity include hosting the activity in various departments around campus, with a focus on an issue of interest to that group. Also, more localized, department-specific workshops would probably further engage faculty in programs, and these activities are planned for the future.

3. Sustaining changes implemented by teaching and learning centers

CETL is still a new entity, and whether it can sustain the change in teaching climate it has initiated remains to be seen. But feedback from the bimonthly Teaching Fellows' Speaker Series and from other activities indicates that faculty participation has remained high and that a diverse group of faculty have attended the events. Further, as evidenced by the success of the peer

observation of teaching program, people are becoming involved in more long-term efforts. Suggestions for sustaining the changes generated by the roundtable participants have also been utilized. For instance, CETL activities are structured to reward faculty who seek to improve their teaching rather than to threaten poor teachers, and an annual recognition dinner at the president's home to publicly recognize and reward the Teaching Fellows may help to sustain CETL's success.

4. Relating teaching and learning center innovations to assessment efforts

Although one of CETL's six goals is directly related to outcomes assessment, supporting assessment efforts of engineering departments remains a *future* challenge for CETL. Because the center is so new, the Advisory Board has chosen to focus CETL's early activities on faculty development and to target the difficult issue of assessment in the future. Specific plans include an assessment fair for faculty to share their activities and approaches to educational outcomes assessment.

5. Providing opportunities for other institutions to benefit from existing teaching and learning centers

CETL has been involved in various efforts to network between schools. The 26th Annual Conference of the Professional and Organizational Development Network in Higher Education in St. Louis (lamar.colostate.edu/~ckfgill/) served as an initial avenue for networking with personnel of teaching centers nationwide, and regional coalitions have furthered that networking. The director has attended various meetings with directors of teaching centers at nearby institutions to foster relationships between the schools. These discussions have resulted in an e-mail listserv and plans for regular meetings of the group. Faculty from neighboring schools have been invited to workshops offered at CETL, and Kettering faculty have participated in workshops at other schools as well. The authors hope to further these collaborations and to expand its networking initiatives in the coming months.

6. Maintaining useful contacts among current and future centers for teaching and learning

Finally, efforts to increase interaction among current centers for teaching and learning in engineering education are underway. The roundtable described here served as a starting point for that interaction. A more informal meeting of leaders of existing engineering education centers was also convened at the 2001 ASEE Annual Conference and Exposition, and an e-mail listserv has been established (eectr@u.washington.edu).

Summary

A small number of teaching and learning centers focused primarily on engineering education now exists around the country. As these centers become more established, their success may encourage others to start such centers at their own institutions. In this paper the authors have compiled the results from a session at the 2001 ASEE National Meeting in the hopes that this information might be useful to individuals considering the development of a teaching and learning center. The discussion at this session was focused on six issues central to the development of centers, and it included input from current center personnel and experienced engineering educators. The authors have also commented here on their experiences in the early development of the Center for Excellence in Teaching and Learning at Kettering University.

References

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